ILLUMINATING ENGINEER

XXVI | August 1933 | Price 9d

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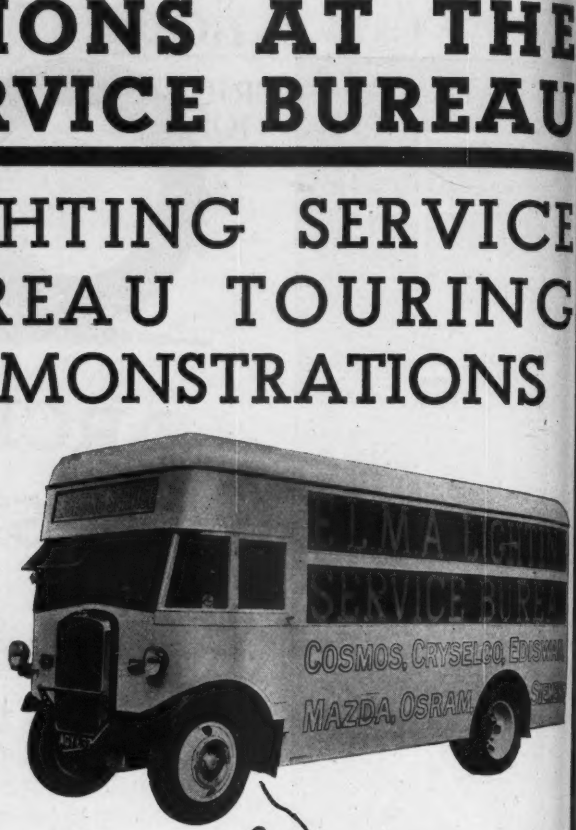
DEMONSTRATIONS AT THE LIGHTING SERVICE BUREAU

LIGHTING SERVICE BUREAU TOURING DEMONSTRATIONS



In order to assist in raising the standard of lighting in the Provinces, the Lighting Service Bureau has inaugurated a touring demonstration which makes available to large and small Provincial towns demonstrations similar to those at the Lighting Service Bureau, 2 Savoy Hill, London, W.C.2. The demonstrations have been specially selected to make an appeal to all classes of consumers.

The itinerary for the ensuing months is available on application.

We ask your co-operation in this effort to bring about an improvement in electric lighting.

The Lighting Service Bureau is maintained by the manufacturers of the following brands of lamps:

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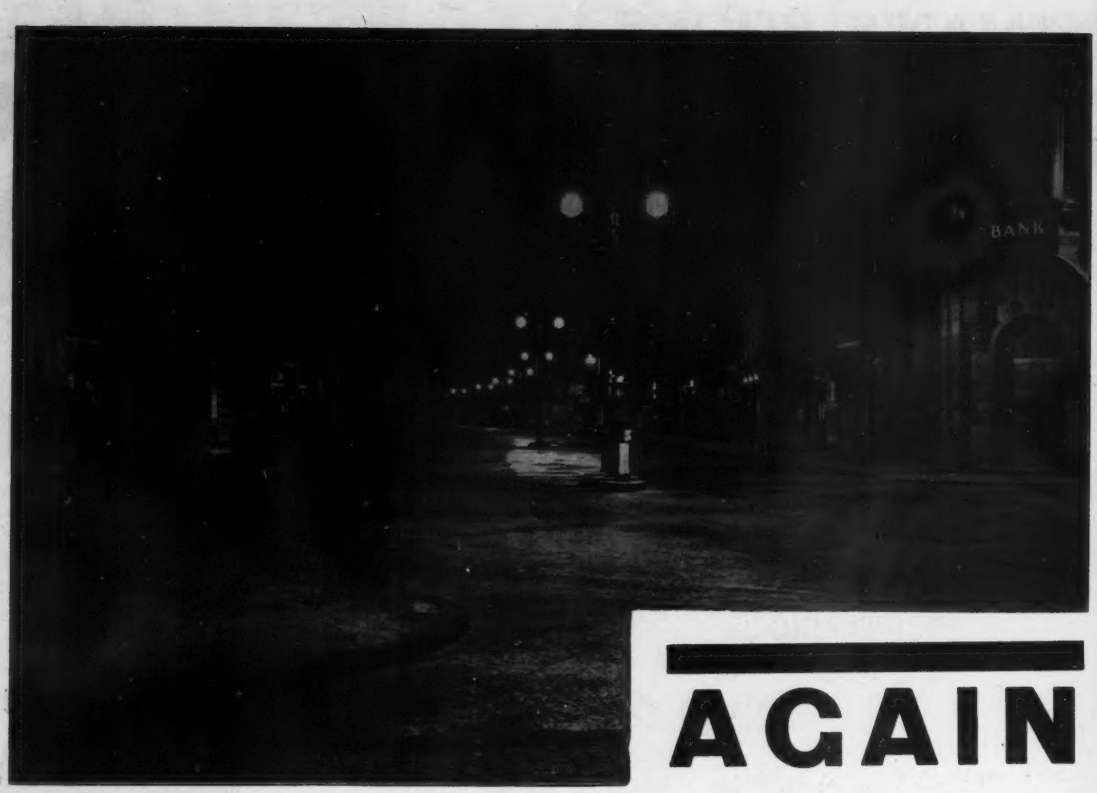

AGAIN

Only REVO Electric Street Lighting was good enough for such an improvement

A daylight picture showing the artistic equipment erected in Bridge Street. The illuminated Bumper Posts, too, are REVO manufacture.

WHO would recognise Peterborough's Old Narrow Street in this Photograph of the recently improved portion? It is now called Bridge Street—a main thoroughfare 50 feet wide, flanked on each side by imposing new buildings. The same design of REVO Street Lighting equipment as that adopted in the rest of the City has been considered good enough for Bridge Street, and consists of REVO Lanterns and solid drawn steel tube standards with cast scrolls, collars and bases. Lamp mounting height is 21 feet and spread between lamps is 6 feet. Spacing between standards is approximately 110 feet. Photometric tests at the B.E.S.A. test points gave minimum illumination of 0.25 F.C. and maximum illumination of 2.5 F.C. Diversity factor 10 to 1. Average illumination was found to be 0.87 candles per square foot of road surface. Illumination utilisation efficiency of 56 per cent. over the road surface alone is obtained. 300 watt Lamps are in use and the installation is notable for its even illumination and entire absence of glare.

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THE ILLUMINATING ENGINEER
THE JOURNAL OF
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Efficiency and Economy in Public Lighting

At this season of the year reports from public lighting superintendents frequently come to hand. We have before us at the moment reports from Liverpool, Oldham and Sheffield. It is instructive to see how the street lighting has fared in each case during a period of somewhat stringent economy.

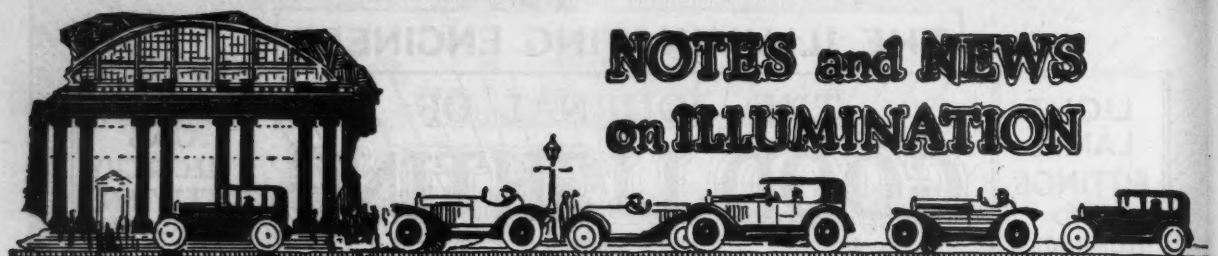
In all three cases diminutions in expenditure, either for 1932 or for 1933 are recorded. The City Lighting Engineer for Liverpool (Mr. P. J. Robinson) states that the net expenditure on public lighting during the year terminating March 31st, 1933, was £116,198, a rate of about 4.85d. in the £, as compared with a previous net expenditure of £121,335 and a lighting rate of 5.13d. in the previous year. Similarly in Oldham the projected expediture for 1933 (£2,279) is £3,000 less than for recent years, and actually only about two-thirds of the amount allotted in 1924. In Sheffield the 1933 figure, £59,328, is approximately £3,000 below the average figure for the period 1928-32.

Such reductions, whilst trying to the public lighting engineer who is keen on initiating improvements, afford good discipline in the sense that they impel him to try and get better results without additional expenditure. In Liverpool, Mr. Robinson has apparently been aided materially in his task by a diminution in the cost of electricity for street lighting, leading to an annual saving of about £2,500. Certain additional recurring annual expenditure in connection with the lighting of new arterial and other roads, streets on housing estates, etc., has been incurred, but elsewhere improvements have been effected by such methods as the installation of lanterns diminishing glare and giving better visibility, which involve no annual increase in expenditure. An instance of discretion in making economies is to be found in the method of effecting reduction at midnight; fittings with two lights in each have been substituted for single-light lanterns, so that one light out of two within each lantern can be extinguished instead of alternate street lamps—a procedure much more favourable to maintenance of uniformity of illumination. In Oldham, Mr. Massey has found it possible, notwithstanding economies, to secure improved distribution of light by the adoption of dome refractors, rustless-steel reflectors, or porcelain-top reflectors, and by substituting more modern and lighter designs for obsolete and cumbrous lanterns casting marked shadows. Similar methods have been adopted by Mr. J. F. Colquhoun in Sheffield, who has found it possible, by using steel reflectors, to increase the illumination by 100 per cent. at the mid-span point, and who records an increase in the total candle-power of public lamps from 2,352,302 to 2,405,886. The photometric laboratory and exceptional testing facilities available in Sheffield have also played an important part in maintaining efficiency. Tests have shown that a deterioration in lighting effect of 50 per cent. is quite likely, unless such factors as drop in voltage or gas pressure, soiling of glassware or ageing of electric lamps and gas mantles are guarded against.

Another condition leading to legitimate economies is the improvement that seems to be taking place in the life of lamps and mantles. Mr. Robinson, for example, reports that the renewals of electric lamps in Liverpool amounted to 2.15 per holder, as compared with 2.4 the previous year. Mr. Colquhoun, in Sheffield, has found an increase of 181 burning hours in the case of mantles and 26 hours in the case of electric lamps (the average effective life being given as 1,600 and 1,077 burning hours respectively). Specially interesting is the experience with 60-watt electric lamps, for which an average life of 1,120 hours is reported. The cause of the marked improvement in the life of the mantles is not evident, but it is suggested that better conditions of storage, or the protection against violent up-draft given by the new metal reflectors may be contributory factors.

The chief result of the effort to bring about economies seems to have been the stoppage of major improvements. This is to be regretted, though it is to be noted that in all these three cases the public lighting engineers have contrived to effect numerous advances regarded as "minor," so far as expense is concerned, but nevertheless of material benefit. The extension in the height of lamp-standards from 11½ ft. to 13½ ft. in Sheffield, with which material progress was made in 1932-33, is, however, one desirable process which has now been checked owing to lack of funds.

One point very strikingly illustrated in these reports is the value of the services of a competent lighting engineer—never so clearly evident as in these times of enforced economy. Their efforts secure that economy is attained in ways that cause a minimum of disadvantage to the public, and—what is even more important—it is only by their skill and vigilance that the avoidance of vast losses in light through inefficient or uncared-for lighting equipment can be avoided.



Association of Public Lighting Engineers

Joint Session at Transport Congress.

We understand that arrangements are now being completed for a joint session of the Association of Public Lighting Engineers and the Institution of Gas Engineers, in connection with the Public Works, Roads and Transport Congress which is to take place in London this autumn. The joint session has been provisionally arranged to take place on the afternoon of November 14th, when a paper dealing with the lighting of arterial roads will be read.

Visit to Shipping Engineering and Machinery Exhibition.

Another event in which the Association of Public Lighting Engineers is participating in the official visit to the Shipping Engineering and Machinery Exhibition, at 5 p.m., on Friday, September 22nd, when members of the Illuminating Engineering Society will also have an opportunity of attending. Formal invitations will be sent to members of both bodies in due course. It is also hoped that some of the Members of the Council of both societies will attend the mid-day luncheon.

Tenth Annual Conference in Margate.

We give elsewhere a summary of the provisional programme of the tenth Annual Conference of the Association in Margate (see p. 190). The Hon. Secretary would be glad to hear as soon as possible from any who still wish to register (final notices and tickets are only sent to those who have intimated their intention of attending). Any members who have yet to furnish the Hon. Editor of the Association (Mr. E. J. Stewart) with details of progress in their respective areas are requested to do so immediately, as the preparation of the annual report, embodying such data, is now in hand.

A Study of Loss of Light due to Smoke

Through the courtesy of Dr. James E. Ives, of the United States Public Health Service, we have received a report summarizing an investigation of loss of light due to smoke during the years 1929 and 1930. The enquiry, which took place in Baltimore, was conducted in a similar manner to that previously pursued in New York, simultaneous measurements with photo-electric apparatus being made in the centre of the city and at Mount Wilson, about 10.5 miles distant, where the air is unusually clear and free from smoke. The results, which are illustrated by numerous diagrams, showed average losses throughout the year of 13.2 per cent. for clear days, 15.9 per cent. for cloudy days, and 14.1 per cent. for all days. On certain days much larger losses, up to 50 per cent., were, however, recorded. The introduction of photo-electric methods of measurement render such investigations comparatively easy, and one would like to see similar comparisons carried out in British cities. The loss of light due to smoke here recorded is certainly substantial, but we fear that in some of our cities—certainly in the case of a London "particular"—it would be considerably more!

A British Standard Specification for Fittings for Double-capped Tubular Lamps

A specification recently issued by the British Standards Institution* contains some useful information on the above subject. Such fittings are very widely used in shop windows, show cases, cornices, etc., and comprise either one fixed contact and one movable contact to each lamp or, where there is more than one lamp, a common lampholder between any two adjacent lamps. Besides giving dimensional details, the specification prescribes the pressure on plunger springs, and contains several clauses ensuring protection of live contacts.

The Colour of Traffic Lines

We notice that the Ministry of Transport has recently invited the opinions of surveyors in regard to the colour of traffic lines and other technical points. Replies of 282 highway authorities are summarized in the report of an M.O.T. committee. Apparently the use of white paint for traffic lines is most usual, though 64 surveyors express a preference for yellow, and some have used alternate white and yellow stripes. The choice of colour seems to be frequently influenced by local considerations and personal impressions, claims for greater durability, better visibility, etc., being advanced in about equal proportions for the two colours. Other comments refer to experiments with inset lines composed of diffusing glass illuminated from below, white concrete, porcelain, rubber and granite. As regards metal surfaces, stainless steel seems to meet with widespread approval, though here again conflicting opinions are expressed in regard to the effect of polished metal. This is hardly surprising when one considers how greatly their effect depends upon the positions of lighting points.

Street Lighting and Insurance Costs

The *Electrical World*, in a recent analysis of road accidents in American cities, recalls that 35,000 people were killed and more than one million injured in automobile accidents during 1931. It is also stated that 40 per cent. of accidents occur at night, and that 35 per cent. of all night accidents are due to inadequate lighting. Further, it is estimated that good street lighting, such as would probably involve additional expenditure of about 100 million dollars, would save 275 million dollars in the costs of traffic accidents and crime. It should, therefore, prove a good investment. If the economic benefits of better public lighting could be demonstrated as clearly as this the task of local authorities endeavouring to find money for improvements would certainly be simplified. But even so, the actual tangible personal benefit to the ratepayer is not sufficiently apparent—hence the further suggestion that better street lighting might enable the householder to save on reduced rates for burglary insurance on his home and theft and accident insurance on his car.

*British Standard Specification for Fittings for Double-capped Tubular Lamps, No. 495—1933, obtainable from the British Standards Institution, 28, Victoria Street, London, S.W.1. Post free, 2s. 2d.

The Century of Progress Exposition at Chicago, 1933*

By AN ENGINEERING CORRESPONDENT

THE World's Fair Exhibition, held at Chicago in 1933, may be called the illumination pioneer of the vast and picturesque show now open in the central city of the United States, for the light emitted, forty years ago, at the time of that exhibition by the star Arcturus has just reached this sphere, and by co-operation of the four Observatories of Yerkes, Harvard, Alleghany (Pa.) and Urbana (Ill.), was received and amplified to give the starting signal for the illumination on the opening day. A large map in the Hall of Science indicated, by means of neon lamps, the "pick-up" of the light by the four different telescopes, and automatically determined the moment of switching on the searchlight which projected its beam above the buildings, thus timing the lighting-up of the 9,960 arc lamps of 2,000 candle-power, 65,672 incandescent lamps (mostly of 16 candle-power), 15 miles of gaseous-tube lighting, 15,000 outdoor incandescent lamps consuming from 10 up to 3,000 watts each, 1,000 floodlighting lamps of 1,000 watts, supplemented by 2,000 of 200 watts, 24 searchlights with a total emission of 1,920,000,000 candle-power for forming the man-made Aurora Borealis, and finally the largest searchlamp in the world of 194,000,000 candle-power, constituting a total load of 2,804 kilowatts.

With such an interesting "send-off" it is not surprising that the record attendance of 185,000 visitors was secured on the first of the 154 days during which the exhibition will be open.

It might fairly be said that without artificial, and therefore controllable, illumination, this vast assembly of instructive exhibits housed in "modernistic" windowless and decoratively coloured buildings, would lose its characteristic features. The full appreciation of its structures, grounds and waterways is dependent on the lighting designed or supervised by Mr. W. d'Arcy Ryan (the engineer responsible for the San Francisco and many other well-lit exhibitions). In this gigantic undertaking Mr. Ryan had the assistance of Mr. C. J. Stahl, who did notable work at the Barcelona Exposition, and also of Messrs. H. K. Mahon and J. W. Sheffer.

In the planning of the installation the economic factors of cost and operation had to be carefully considered, as well as the production of scenic effects. The latter involved careful consideration of the coefficients of reflection from the coloured building and the vista range in order to secure results that did not clash. The former considerations ruled out the use of mobile colour effects, whilst large-scale ornamentation by "jewel" lighting was considered inappropriate. Utilitarian lighting giving the maximum of foot-candles for a given outlay, and the use of incandescent untinted lamps, are therefore the predominant achievement.

The brilliant-coloured architectural features called for and receive generous illumination, although the varying level of the grounds rendered the elimination of glare difficult, and therefore limited the use of ordinary floodlighting equipment. Special standards of simple design, constructed without attempt to conceal their structural features, were designed to carry both the local and the projection lighting devices, the floodlighting being mainly used to secure relief. In like manner the gasfilled tubes were chiefly applied to intensify effects initiated by the materials of the buildings.

A great variety of standards was required, one pattern being constructed to carry twenty-two special 30-in. 100-watt tubular vacuum lamps, the first of their kind used for outdoor work. Another, called the "shower," has shower-like scrolls attached to the top of a 20-ft. pole fitted with 325 15-watt lamps at 4-in. centres, and simulates a fountain. Still another variety, mainly used for supporting floodlighting lanterns (which are concealed at the top) carries several lamps placed vertically one above the other and screened by tinted weatherproofed linen devices in vase or torch form. A characteristic standard is the "bar-and-disc" design in which the horizontal lamps forming bars of light at right angles to one another are separated by horizontal discs of polished metal.

The floodlighting standards carry groups of lamps, either in vertical or horizontal alignment, at a height of 38 ft. above ground level.

The extensive lawns are lit with "mushrooms," which can be well described as Japanese umbrellas of semi-transparent "micarta," covering a 150-watt lamp, the overall height being 4 ft. The majority of the light is spread below the margin of the mushroom by a diffractor. The lighting effect is similar to that observed on grass under trees on a bright day, with the additional advantage that the eye is screened from any direct light. Two thousand of these mushrooms add greatly to the beauty of the landscape.

The "Aurora Borealis" is produced by the light, from 24-in. and 36-in. projectors fitted with 1,500-watt lamps, thrown on steam masses operated so as to produce fans and plumes of variegated light over the court of the Electrical Building. Some of the projectors used for this purpose are located on the Sky Ride, which is 600 ft. above ground level.

The numerous trees are in many instances fitted with belts of lamps screened by semi-transparent material, the majority of the light passing upwards among the leaves and boughs, constituting in this manner an unusual appearance of a very attractive nature, especially during the warm evenings usual in Chicago.

The Amusement Park, an inevitable feature of general exhibitions, lies between the two main groups of buildings, and is decoratively illuminated by a scintillating canopy of tinted beams carefully controlled for time and colour from twenty-four searchlights of 125-ampere rating, with an aggregate of $1\frac{1}{2}$ million candle-power projected on steam clouds, and, at certain times, interspersed with fireworks and star-spreading bombs.

The illumination of the fountains is a special feature; one in particular is original in that it consists of three concentric steps, 70 ft. in diameter, of polished metal on which are projected different-coloured lights, while from the stippled reflecting surface of a canopy suspended 50 ft. above the basin, from which the light of 135 floodlighting projectors using red, amber, green and blue screens, is reflected through the 496 water-jets using 1,200 gallons of water per minute. In another instance seventeen 36-in. projectors of unique design, in that they utilize the light from mercury-vapour lamps, throw intersecting beams that form a silver-like fan resembling a waterfall.

The three fountains in the South Lagoon, placed 150 ft. apart, are intended to constitute a palette of twenty-five colours. From seventy under-water projectors emitting light of four colours, controlled as to brilliancy by a Thyratron reactor, eight specific

* For fuller details of the lighting of the Exhibition readers may be referred to the *Electrical World*, May 13th, 1933, p. 601, May 27th, pp. 657-662, 673-678, 684-704; June 6th, p. 706; June 10th, p. 758 and pp. 763-765; also *Electrical Engineering* (U.S.A.), May, 1933, p. 346; June, 1933, p 421.

effects are produced, each covering a period of 75 seconds, terminating by a spouting of water to the height of 80 ft., the total period of each cycle being ten minutes.

Another novelty is the pylon illuminated by new units, the neon and the mercury hot-cathode lamps, forty-eight in number of each kind, projecting red and greenish-yellow light respectively. The light from these units illuminates the vertical sides of the fins of the pylon, each of which is 38 ft. long, producing a striking colour result.

The interiors of the buildings are lit by lengths of gaseous tube, the Hall of Social Science having 2,000 ft., of which 600 ft. is in the roof, the Hall of Science 4,760 ft., while the portals are rendered visible by no less than 3,500 ft., other buildings using lengths in proportion to their extent and the nature of the products shown. The actual exhibits of illuminating devices and appliances for use of illuminating engineers present no special feature apart from their extent and variety.

A word or two may be said in regard to the cable protection. After consideration of total costs of installation and removal, it was decided to provide wood log conduits buried 20 ins. in the soil, and to bring them to the points of consumption, providing, where necessary, wooden man-holes, the intention being to withdraw the cables at the end of their utilisation and leave the conduits to rot in the ground. This was considered to be the most economical system. The cost of the electrical energy is also not without interest. The terms fixed for all consumers involved an assessment of 1.40 dollars per kilowatt for the first 25 kw. demand, and 0.75 dollar per kilowatt for all in excess, plus $3\frac{1}{2}$ cents per kilowatt-hour for the first 3,000 kilowatt-hours, decreasing on a straight-line scale to 0.65 cents for quantities in excess of 100,000 kilowatt-hours. This is claimed to be the lowest price known for electrical energy supply. The contingency of local, or total, failure of current supply is provided for by an emergency supply from storage cells.

Association of Public Lighting Engineers

Tenth Annual Meeting and Conference. Margate, September 4th-7th, 1933

WE summarize below the provisional programme of the tenth Annual Meeting and Conference of the Association of Public Lighting Engineers, which is to take place in Margate during September 4th-7th, 1933:—

MONDAY, SEPTEMBER 4th.

Arrival at Margate.

4-30 p.m. Council Meeting at the Queen's Highcliffe Hotel.

8-30 p.m. Reception at the Winter Gardens by the Mayor and Corporation of Margate. (Cabaret, dance and light refreshments; evening dress optional).

TUESDAY, SEPTEMBER 5th.

10 a.m. Official Welcome and Opening of Conference at the Queen's Highcliffe Hotel.

Induction of New President.

Delivery of Presidential Address by Mr. E. M. SEVERN.

Presentation of Data on the Lighting of Margate by Mr. H. V. EMPTAGE (Public Lighting Superintendent of Margate).

A Paper on the Lighting of Seaside Resorts will be read by Mr. W. N. C. CLINCH.

1 p.m. Members will be entertained to Luncheon at the Queen's Highcliffe Hotel by the Isle of Thanet Gas Light and Coke Company.

2-30 p.m. A Paper will be read by Mr. G. H. WILSON on Gaseous Luminous Discharge Lamps and their Application to Public Lighting.

(In the course of the afternoon an Excursion to Canterbury, for the benefit of Ladies and those not participating in the Meetings, will be arranged.)

WEDNESDAY, SEPTEMBER 6th.

10 a.m. ANNUAL MEETING and Transaction of Formal Business.

A Paper will be read by Mr. F. X. ALGAR on Street Lighting in the Irish Free State.

1 p.m. The Association Luncheon will take place at the Queen's Highcliffe Hotel.

2-30 p.m. A Paper on the Public Lighting of Paris will be read by Mr. J. W. PARTRIDGE (Chief Engineer in charge of Street Lighting, Paris).

A Paper by Mr. J. P. BLACKMORE on the Public Lighting of Bombay will be presented.

THURSDAY, SEPTEMBER 7th.

No Conference Business will be arranged, so that Members may have the opportunity of visiting places of interest in the vicinity of Margate.

The evenings will be free for Members to make their own arrangements.

We have been asked to draw the attention of members and delegates to the following points:—

(1) Intimations of attendance, if not yet sent in, should be dispatched at once to the Hon. Secretary (Mr. J. S. Dow), 32, Victoria Street, London, S.W.1).

(2) Badges for the use of members and delegates (3s. 6d. each) can now be ordered, and should be used for purposes of identification.

(3) Visitors are asked to make it quite clear whether they desire to attend (*a*) the reception, (*b*) the Association's luncheon, and (*c*) the luncheon given by the Isle of Thanet Gas Light and Coke Company.

(4) Accommodation should be booked early. The headquarters will be at the Queen's Highcliffe Hotel, but particulars of others accompany the programme.

(5) Railway vouchers enabling return tickets to be obtained at the rate of one and a third times single fare are obtainable.

(6) Information illustrating progress in public lighting, for use in preparing the Annual Report, should be sent in to the Hon. Editor of the Association (Mr. E. J. Stewart, 20, Trongate, Glasgow).

Illuminated Road-Traffic Signals

A SERIES of interesting articles on the above subject by Capt. W. J. Liberty have appeared recently in "Roads and Road Construction." Some of the aspects of the subject touched on by Capt. Liberty may be of interest to readers of *The Illuminating Engineer*.

The Traffic Problem.

The articles begin with a review of the traffic problem as a whole. Some indication is given of the enormous task which traffic control presents to the police and to road authorities. It is mentioned that in the area of London and Home Counties 1,278 police constables were on duty for traffic control in 1932, and this represented a cost of somewhere about £450,000 per annum. It is estimated that in the whole country about 4,300 policemen are employed in the direction of traffic.

It is clear that the employment of illuminated traffic signals will effect a big saving in wages of police constables, and will also release the police for work which is more directly their concern. Roughly speaking, it is estimated that the capital cost of an average installation of light signals will be equal to the annual cost of the police formerly necessary, and therefore there should be little hesitation in adopting signals of this character so long as there is certainty that the traffic at the particular point in question can be handled adequately by this system.

Various Types of Signals in Use.

It is now some years since the earliest attempts were made at controlling traffic by signals. One early form was the use of an ordinary semaphore arm controlled mechanically from a central police box. This type was introduced at Brighton. In the early days of colour lights a single red light was adopted in Paris, with a warning bell to indicate that a change was about to take place. In this case traffic was resumed when the red light was extinguished. It has now become general practice to use three-colour lights—green, amber, and red—the amber giving warning of change. There has been some controversy as to the necessity for the intermediate amber light, and it has actually been dispensed with in some parts of the United States, but the general feeling in Great Britain seems to be that it is a very desirable feature so long as it is recognized that the amber light is only for warning and that traffic must not move until the green light is exhibited.

The construction of the signal lamps usually takes the form of a cast-iron housing containing the three lamps one above the other, the red light being usually fixed at the top and the green at the bottom. The light-source is generally an ordinary gasfilled electric lamp fitted with standard screw holder and of 60-watt capacity. In front of the lamp is a lens system designed to give a concentrated beam of sufficient power to be visible in full daylight. In order to avoid interference with the beam by sunlight, the lights are usually well shaded in the upper semi-circle. The exact angle at which the light beam is directed and the general arrangement of the colour lights must always be specially designed to suit a particular intersection of roads, and it is hardly possible to lay down any regular system in this respect except for an average right-angle crossing.

Historical Survey.

Dealing with the matter historically, it is pointed out that a system of traffic signals was installed in New York City as long ago as 1918, and in France experiments were made even earlier, although nothing definite was evolved until 1922, when red-light control was introduced in Paris. In Germany also traffic signals were extensively developed in 1926.

In Great Britain the subject of traffic signals was discussed at a meeting of the Association of Public Lighting Engineers at Brighton in 1927, when the importance of initiating some standard practice was emphasized. Largely as a result of preliminary discussion at this meeting and a subsequent meeting in London, the various parties concerned were called together by the British Standards Institution in July, 1928, but no definite action was taken at the time, largely owing to a letter from Sir Henry Maybury, of the Ministry of Transport, who pointed out that this was to some extent an international question, and it was not desired at that time to take any action in this country which would conflict with schemes being adopted abroad. In 1929 a memorandum was issued by the Ministry of Transport making certain recommendations with a view to obtaining uniformity in any illuminated traffic signals that might be adopted, and during subsequent years nearly all the large towns have, in at least some control points, installed traffic signals. The Royal Automobile Club in 1932 published a list of nearly 70 towns in Great Britain having traffic signals.

Requirements in Traffic Signals.

After pointing out that there are certain situations where automatic signals are not suitable, such as where traffic conditions and densities vary very greatly, and also at intersections where there is a heavy proportion of turning right, the general requirements of a traffic-control system are dealt with and certain main features essential to any such system are mentioned, e.g.:—

(1) It is essential that the cycle time, i.e., the total period of green, amber, and red light, should be readily adjustable.

(2) The ratio of each colour as a percentage of the whole cycle should also be capable of easy adjustment.

(3) It should be possible to introduce hand control for any special periods, and this should have no interference with the normal cycle when the latter is resumed.

Classification of Systems.

A description of the various systems that have been used in this country follows, and these are grouped in classes thus:—

(1) The synchronized system in which all the signals change at the same time along the main thoroughfare. It is pointed out that this is not suitable where intersecting streets do not occur at regular intervals, and it is not a system that is much favoured in Great Britain.

(2) The limited progressive system, which is similar to the above, but in which the red and green lights are shown at alternate intersections simultaneously. If the intersections are fairly regular the traffic under this system becomes divided into a series of blocks, and those travelling at the approved average speed should meet with the green light on approaching each intersection.

(3) The flexible progressive system, which is similar in general plan to the above two systems but differs in respect of the amount of adjustment that can be made. Its main features are that the ratio periods can be adjusted at each intersection, and the cycles of each controller at the intersections are relatively set to suit the time taken by vehicles to reach them from the previous intersection.

The Oxford Street Installation.

This last method was adopted in Oxford Street after a very elaborate census had been taken of the traffic, both in the main and the cross streets, at different times of the day. The data thus obtained enabled the control scheme to be adjusted accurately to the varying conditions and the irregular distances between the intersections. In addition to the usual automatic working of the local controller at each intersection with the predetermined ratio for the passing time between the main street and the cross street, there are what are called "chronolising" lines in a special five-core cable which has been run along the whole length of Oxford Street, and these lines ensure that the local controllers never get out of step with each other. The controllers at individual intersections in Oxford Street are all set to a complete time-cycle of 59 seconds. Of this cycle three seconds are occupied in all cases with the intermediate amber light, but the proportion between the green light for the main thoroughfare and that for the intersection varies according to the situation. At the Oxford Circus intersection with Regent Street the periods are 28 seconds each, but at all the other intersections there is a preponderance of time allocated to the main stream of traffic, the ratio being as much as 42 seconds for the main stream as opposed to only 14 seconds for a minor intersecting street. Tests of traffic passing in Oxford Street before and after the installation of the traffic signals showed an improvement in traffic speed of approximately 50 per cent. during average conditions, and as much as 90 per cent. during the time when the traffic is particularly congested.

Traffic-actuated Signals.

Traffic-actuated signals are now becoming more common where special conditions arise. They are particularly useful if an intersecting street has very light traffic compared with the main street flow. In such cases period control throughout the day could hardly be justified. There are various methods of arranging for these signals to be actuated by the traffic that comes along.

(1) *The Magnetic Conduction Type.*

In this case the vehicle approaching the junction with the main street enters the magnetic field of a detector buried under the road, and by this means operates the light in the main road, turning that to red and giving green to the intersecting street. After the passage of the vehicle, unless another vehicle is following immediately, the normal conditions on the main route are restored.

(2) *The Mechanical Type.*

In this type the detectors are fixed in the surface of the road in such a manner that they are operated by the weight of the vehicle approaching. Otherwise they are similar to those mentioned above.

(3) *The Light-Valve Type.*

In this case the actuation is by the interruption of light rays due to the presence of a vehicle on the portion of the road approaching the intersection. Some sort of light-valve, such as a photo-electric cell, is fixed in a suitable position to be operated in this manner. This system calls for some special illumination at night, so that there is a beam of light to be interrupted by the approaching vehicle.

Electro-matic System.

The electro-matic system is a form of the first type mentioned above, in which the whole control system is automatically operated by detectors placed in each approach road and connected to a main controller which operates the usual colour-light signals according to the state of the traffic. It is claimed for this system that it can be applied to almost any conditions of traffic, and is very flexible in the adjustments that can be made.

A single car approaching an empty intersection receives right of way immediately and is not required to slacken speed or stop. Should two cars pass over the detectors simultaneously, the right of way is given to one and the other is remembered, the right of way being accorded as soon as the first is safely through. A continuous stream of traffic is never interrupted except by the arrival of cross traffic, which only waits for a gap and then is allowed to proceed. Tram-cars indicate their arrival by means of overhead detectors and when passengers have alighted and boarded, the car moves on and indicates its presence, etc., in the usual manner. It will operate at multi-way as at isolated intersections. Should a vehicle break down on a detector the control automatically gives each stream the right of way alternately until the vehicle is removed. The right of way can be secured for a minor road by a vehicle traversing a detector, and can be extended by the passage of other vehicles up to a predetermined maximum period, at the expiration of which the right of way will be arbitrarily returned to the arterial road.

Pedestrian and Other Signals.

Pedestrian signals can be worked on the automatic system, but on the whole pedestrians are best catered for by push-button systems. In these the light signal remains green to the road until a pedestrian operates the push-button, when, after an interval of amber light giving warning of the change, a red light is shown to the road and an indication to "cross now" is given to pedestrians. The normal state of the signals is restored after an interval of a few seconds, which is sufficient to enable the pedestrians to cross.

Reference is made finally to one or two of the other types of illuminated signals that are used in connection with road traffic, such, for example, as the flashing signals for warning at remote junctions on arterial roads, where dissolved acetylene is often used owing to the absence of any electrical supply. Illuminated signals are also used frequently now when road repairs are in hand causing an obstruction on an important road, and such temporary signals are worked automatically instead of being hand-operated, where the saving in labour is an important consideration.

Literature on Lighting

(Abstracts of recent articles on Illumination and Photometry in the Technical Press)

Abstracts are classified under the following headings: I, Radiation and General Physics; II, Photometry; III, Sources of Light; IV, Lighting Equipment; V, Applications of Light; VI, Miscellaneous. The following, whose initials appear under the items for which they were responsible, have already assisted in the compilation of abstracts: Miss E. S. Barclay-Smith, Mr. W. Barnett, Mr. S. S. Beggs, Mr. F. J. C. Brookes, Mr. H. Buckley, Mr. L. J. Collier, Mr. H. M. Cotterill, Mr. J. S. Dow, Mr. J. Eck, Dr. S. English, Dr. T. H. Harrison, Mr. C. A. Morton, Mr. G. S. Robinson, Mr. W. R. Stevens, Mr. J. M. Waldram, Mr. W. C. M. Whittle, and Mr. G. H. Wilson. Abstracts cover the month preceding the date of publication. When desired by readers we will gladly endeavour to obtain copies of journals containing any articles abstracted and will supply them at cost.—ED.

(*Continued from p. 179, July, 1933.*)

I.—RADIATION AND GENERAL PHYSICS.

201. Long-wave Arc Spectra of Alkalis and Alkaline Earths. W. F. Meggers.

Bureau of Standards Journal of Research, Vol. 10, No. 5, p. 669, May, 1933.

New types of photographic plates, sensitive to red and infra-red radiation, are employed to record the emission spectra of electric arcs containing alkalis or alkaline earths. Several lines characteristic of sodium, potassium, rubidium and cesium are observed in the interval 8,500 to 11,800A. A large number of lines are measured in calcium, strontium and barium spectra between the limits 6,500 and 11,330A. A new system of band heads, presumably due to Ca O, was found in the infra-red. W. B.

202. Infra-red Spectra of Neon, Argon and Krypton. W. F. Meggers and C. J. Humphreys.

Bureau of Standards Journal of Research, Vol. 10, No. 4, p. 427, April, 1933.

The first spectra of neon, argon and krypton have been photographed in the infra-red (7,600 to 12,200A) with two new Eastman emulsions having P and Q types of sensitization with sensitivity maxima at 8,600 and 9,700A, respectively. The sources were Geissler tubes operated with uncondensed high-voltage a.c. discharges, and the spectrographs were concave gratings of 21 ft. radius. About 200 infra-red lines have been photographed in the spectrum of each of the noble gases, and analysis has resulted in the confirmation and extension of the tables of spectral terms. Many of the new lines can be accurately computed from relative terms, and such calculated values may serve as preliminary standards of wavelengths in the infra-red. W. B.

203. Photographic Reversal by Desensitizing Dyes. B. H. Carroll and C. M. Kretchman.

Bureau of Standards Journal of Research, Vol. 10, No. 4, p. 449, April, 1933.

Latent images on a photographic plate which has been exposed, then bathed in solution of a desensitizing dye, may be destroyed by a second exposure to light of the proper wavelength. There is good correlation between reversal and energy absorption. Characteristic curves of the process were made by time-scale exposures. The evidence supports the hypothesis that the process is an oxidation, and is the reverse of ordinary sensitization chemically as well as photographically. W. B.

II.—PHOTOMETRY.

204. A Photo-electric Instrument for Comparing the Strength of Coloured Solutions. E. W. H. Selwyn.

Journal of Scientific Instruments, Vol. 10, No. 4, p. 116, April, 1933.

An instrument is described for use in comparing the strengths of coloured solutions. A photo-electric method employing a bridge circuit valve amplification is used. The description of the instrument is accompanied by a diagram showing the complete instrument and the circuit adopted for amplifying the photo-cell circuit. W. B.

205. A Sonic Nephelometer. J. S. Wilson.

Journal of Scientific Instruments, Vol. 10, No. 4, p. 97, April, 1933.

An instrument is described for the comparison of light transmitted by translucent materials, in which a photo cell is employed to detect differences in the intensity of two beams illuminating the cathode alternately after having passed through the material under test. A brief discussion of the sensitivity of the method is given, and some applications are suggested. W. B.

206. Transmission of Light in Diffusing Media. R. F. Hanstock.

Opt. Soc., XXXIII, No. 4, p. 137, 1931-32.

The transmission of light by thin films of diffusing material is investigated, a flicked photometer being used for the purpose. The intensity I of diffuse light transmitted by a thin film in a direction normal to the surface is related to the film thickness by the empirical equation:

$$1/I = C(1 + ax + (ax)^2)$$

where a is a constant depending on the opacity of the material to diffused light, and c is approximately constant for all substances. The ability of a film to hide a contrasting background is proportional to the quantity of $H = 1/I$, complete hiding being obtained for a value of H which is constant for all the materials investigated, namely, a number of coloured paints and papers. An accurate method of measuring the hiding power of such films is described. J. M. W.

III.—SOURCES OF LIGHT.

207. Luminous Tube Lighting. Dr. U. Lazzaro.

L'Illuminazione Razionale, pp. 68-73, March, 1933.

After description of the physical and illuminating properties of gasfilled tubes, supplemented with novel tabular information, practical applications for signalling purposes, as well as for illumination and advertisement, are illustrated and described. J. E.

208. The "Mercra" Lamp. Anon.

Elect., Vol. 110, p. 806, June 16th, 1933.

Particulars and photographs are given of a new mercury-vapour lamp used in a floodlight of special design. C. A. M.

209. Artificial Sunlight. Anon.

Elect. 110, p. 864, June 30th, 1933.

A new type of gaseous-discharge lamp, known as the "Sunlight" lamp, is now available for general lighting purposes. Details and photographs of installations are given. C. A. M.

210. Economic Considerations of Electric Illumination. M. R. Grandjean.
Lux, pp. 47-50, *April-May*, 1933

Economy in an electric-lighting installation is contingent on lamps of the best quality being used. The lives of incandescent lamps operated at pressures from 30 per cent. below to 30 per cent. above the rated value are compared, and a comprehensive table, based on a 1,000-hour period, is presented in support of the argument against using inferior quality lamps, even if they cost absolutely nothing. J. E.

211. Street-lighting Experiments at Croydon. Anon.
El. Times, 83, *p.* 768, *June 15th*, 1933.

An account is given of a new street-lighting installation of electric discharge lamps at High Street and North End, Croydon. With each discharge lamp three 200-watt tungsten-filament lamps are run, the total wattage consumption being now 1,020 watts per post, as compared with a previous value (using all-tungsten lamps) of 1,500 watts; the same light-output is maintained owing to the much higher efficiency of the discharge lamp. The colour-rendering is stated to be good, and to cause ordinary lighting to look dull and uninteresting by comparison. Owing to the very small quantity of auxiliary apparatus required for the discharge lamp it has been found possible to use the original housings, only adding a small box on or at the base of the pole to accommodate the choke and power-factor correction condenser. A photograph is presented to illustrate the statement that the street and shops on either side are effectively and evenly illuminated.
W. R. S.

212. Street Lighting and Insurance Costs. Editorial.
El. World, 101, *p.* 539, *April 29th*, 1933.

The relationship between the lighting of streets and the amount paid by insurance companies in compensation for street accidents and for burglary is discussed. It is suggested that it may be economically profitable to increase expenditure on street lighting in order to save on payments in insurance compensations. W. C. M. W.

213. Aerodrome lighting. Ford Angström.
Elect., Vol. 110, *p.* 644, *May 19th*, 1933.

A summary of a lecture given by the author to the Stockholm Chamber of Commerce, reported in "Tecnisk Tidskrift," on the general lighting of aerodromes in Germany, France, Switzerland and Holland. C. A. M.

214. Restaurant Lighting. Anon.
Lighting, pp. 11-16, *May*, 1933.

Electric incandescent lamp and gaseous-tube decorative lighting of various styles used in restaurants, cafés, etc., illustrated by twenty-eight descriptive pictures. J. E.

215. Lighting the Low-ceilinged Home. H. M. Gordon.
Lighting, pp. 22-23, *May*, 1933.

The low ceiling of most modern homes requires suitably designed fittings, and the author gives valuable suggestions based on psychological as well as physical principles. J. E.

216. The Economic Conference. Anon.
Elect., Vol. 110, *p.* 810, *June 16th*, 1933.

The lighting of the main hall at the World Economic Conference is indirect, and is carried out by means of sixty silvered-glass reflector units, each equipped with a 1,000-watt lamp. A photograph is given. This is the first time in this country that such a system has been used on so large a scale. C. A. M.

217. Electric Lighting and Court Functions. Anon.
El. Times, 83, *p.* 673, *May 25th*, 1933.

A description, with photographs, of the artificial lighting used in a London Court-florist's establishment. W. R. S.

218. Electricity on the Stage. F. G. H. Macrae.
El. Times, Vol. 83, *p.* 824, *June 22nd*, 1933.

The consumption of electricity used for stage lighting has increased greatly during the last few years. Some of the reasons given for this increase are a greater use of colour media; a tendency to use high-powered spotlights to obtain more natural effects than with battens and footlights; and, an innovation, the use of 1,000-watt focal lamps around the circle front. A photograph of such an installation is given. The increased use of reactance dimmers is predicted with the more universal use of alternating current in England. W. R. S.

219. Colour Lighting for the Stage. A. L. Powell.
El. World, 101, *pp.* 648-49, *May 20th*, 1933.

The colours which have been traditionally used for the fixed lighting effects for stages are red, white, blue, and sometimes amber. It is pointed out that either pure or mixed, these colours are of little utility, and produce unnatural effects. The following colours are suggested as being of more use in this connection: medium straw, a light pink or lavender, steel or moonlight blue, and either medium green or fire red. W. C. M. W.

220. Stage Lighting Technique Eliminates Window Glare. Anon.
El. World, 101, *p.* 458, *April 8th*, 1933.

Describes how stage-lighting technique has been applied to eliminate street reflections from the glass of a show window. Special adjustable 200-watt reflectors are mounted in three rows across the ceiling of the window, being hidden from the spectator by means of valances. Photographs compare the old and new lighting. W. C. M. W.

221. Economic Analysis of Sports Lighting. E. J. Ingram.
Am. Illum. Eng. Soc., Trans., 28, *pp.* 437-448.

The paper analyses the costs of night lighting for golf courses and tennis courts. Formulæ and charts are given for the calculations, and the author concludes that care must be taken if a true estimate of the financial value of such lighting is to be obtained. G. H. W.

222. Floodlighting of Sports Grounds. H. F. Fullerton.
El. Times, Vol. 83, *p.* 823, *June 22nd*, 1933.

Gives an account, with a photograph, of a recently installed floodlight system in Vancouver, B.C., where a field used either for baseball or for football has been illuminated for night playing. The consumption is 272 kw., and the chief sources of light are located in nine towers, each 90 ft. high, placed around the ground. Careful design has reduced the glare to a minimum, but the illumination on the ground is nevertheless very high, 13 foot-candles being furnished for football and 18-25 for baseball. The results are said to be excellent, even the highest balls being easily visible. W. R. S.

223. Floodlighting at the Aldershot Tattoo. Anon.

El. Times, 83, *p.* 705, *June 1st*, 1933.

Describes, with the aid of photographs, the floodlighting arrangements for the Aldershot Tattoo, which is this year more elaborate than ever. The recently introduced gaseous-discharge tube floodlights are used on a large scale for the first time, and " The Castle " is lit in blue. The installation is said to be very effective, and also economical as compared with the older method of gasfilled lamps and colour filters. W. R. S.

224. Lighting an Exposition. W. d'A. Ryan.

El. World, 101, *pp.* 687-688, 697-698, *May 27th*, 1933.

Describes the lighting of the " Century of Progress " Exposition at Chicago. The lighting equipment, whilst being artistic, is also utilitarian, with a view to reducing lighting costs as much as possible. Over 3,000 kw. are used for lighting by incandescent lamps, arc lamps and gaseous-discharge tubes. Individual lighting effects and equipment are described, and a photograph showing the appearance of one of the buildings by night is reproduced. W. C. M. W.

225. Floodlight Effects at Monte Carlo. Anon.

El. Times, 83, *p.* 767, *June 15th*, 1933.

Gives a brief description of the floodlighting of the Casino, Monte Carlo, which is carried out in colour. Two photographs are given, one a close-up of the Casino and the other a view of the whole town looking across the harbour. The effect is said to be very impressive. W. R. S.

226. Floodlighting at the Royal Bath Hotel. Anon.

El. Times, 83, *p.* 780, *June 15th*, 1933.

An account of the new Mazda " Mercra " lamp, which, having a consumption of 400 watts, is stated to have an efficiency of 45 lumens per watt. The new lamp requires as auxiliaries only a limiting choke and a 20-microfarad condenser. Colour rendering is regarded as fairly good, but reds appear brownish. A special type of floodlight projector has been developed to house the lamp and a photograph is presented. A photograph of the lamp itself and the floodlighting at the Royal Bath Hotel is also included. W. R. S.

227. Floodlighting and Electric Fountains for Waterworks.

Am. Illum. Eng. Soc., Trans., 28. *pp.* 407-417, *May*, 1933.

A description is given of the floodlighting of the Raymond Dam and Headworks at Wanaque, N.J., U.S.A. The dam is lighted by fifty 1,000-watt projectors, while 1,000-watt and 500-watt under-water projectors are used for the colour lighting of aerator fountains. Details of wiring and the drainage of the lights are given. G. H. W.

228. Fountain Lighting. H. E. Lippman.

Elect. J., Vol. 30, *No.* 5, *p.* 197, *May*, 1933.

A continuation of the article in the April issue. The various types of control available are discussed, viz., flasher, motor-driven dimmer, and saturated reactor, with rheostatic or thermionic control. The latter is available with " film " type or " disc " type control, in which the intensity of the light is determined by a conducting strip sewn on to a moving film or disc, and which permit of very flexible programmes. The various types are illustrated. J. M. W.

229. Mobile Colour-lighting for Cascade Waterfalls. J. M. Malnight.

Lighting, pp. 10, 11 *and* 28, *October*, 1932.

A technical description of the colour lighting of the water flowing over the series of falls of the Sparks Cascades, in Jackson, Michigan. A " Thyratron " reaction dimmer which secures a minimum power loss when dimming, combined with great simplicity, controls the 1,230 lamps used, which are operated up to 14½ per cent. over voltage, thus securing with 23½ per cent. extra energy 56 per cent. additional light, but with a decrease in life of 18 per cent. J. E.

230. The " Electrical Times " Electric Supply Tables of Costs and Records. Anon.

El. Times, 83, *Supplement, June 1st*, 1933.

Tables of returns made by electrical supply companies of Great Britain, including average price per unit obtained for public lighting, etc. W. R. S.

231. Note on the Penetration of Direct Sunlight into Buildings. A. F. Dufton.

Journal of Scientific Instruments, Vol. 10, *No.* 4, *p.* 115, *April*, 1933.

A chart is described for the determination of the duration of sunlight receivable at a point within a building. W. B.

232. The Branksome Chine Solarium. Anon.

El. Times, 83, *p.* 774, *June 15th*, 1933.

Gives a short account with a photograph of the new " Solarium " opened at Bournemouth. The ultra-violet radiation for this sun-bathing lounge is provided by an " Ajax " ultra-violet ray lamp emitting light from 2950 Angstrom units upwards. It is a mercury-vapour quartz burner, and has an automatic starter. Red, blue, and amber lights make up the illumination to a quality said to be closely resembling sunlight. W. R. S.

A Review of Gaseous Conduction Lamps

An informative paper on the above subject, by L. J. Buttolph (*Trans.*, Ill. Eng. Soc., U.S.A., February, 1933), reviews recent efforts to secure higher luminous efficiency by utilizing gaseous discharge tubes. The distribution of energy in the spectra of various gases is illustrated, and the important part played by the electrodes in such lamps explained. Such details as the use of heated cathodes, methods of starting the discharge, and the nature of the auxiliary devices and circuits necessary to secure stability are discussed. The practical efficiency of such lamps is thus determined by quite a variety of factors, such as the energy absorbed in auxiliary stabilizing appliances, but the author presents the following approximate data for lamps of 500-watt consumption: —

Nature of Source.	Practical Efficiency Lumens per watt.
Sodium Arc—Unrated life	32
Projection Incandescent	26
Mercury Arc in Quartz	21
Incandescent Lamp	19
Mercury Arc—Low pressure	18
Neon—Inductive ballast...	17
Neon—Resistance ballast	13
Tungsten-Mercury Arc	12
Helium—Resistance ballast	4

It was stated in the discussion that in the case of sodium lamps arranged in a series circuit an efficiency of 45-50 lumens per watt is practicable.

The Lighting of the Municipal Gallery of Modern Art, Dublin

THE history of the Municipal Gallery of Modern Art, in Dublin, opened on June 19th, presents features of interest. Its origin may be traced to the movement initiated by Sir Hugh Lane about 30 years ago. In 1902 he arranged an exhibition of Old Masters of the Early English and French Schools in the Royal Hibernian Academy Rooms, and in 1903 the establishment of a Municipal Collection of Modern Pictures in Dublin was definitely suggested.

A collection of pictures intended as the nucleus for further development was subsequently formed by Sir Hugh Lane, but although in the subsequent period the idea of providing a new gallery has frequently been brought forward, for some time no definite action was taken, and ultimately Sir Hugh Lane removed his special group of Continental pictures to England, where they now hang in the Tate Gallery.

After the tragic death of Sir Hugh in the Lusitania disaster in 1915 the agitation for the new gallery continued. Ultimately, in September, 1927, President Cosgrave formally handed over to the Commissioners an 18th century mansion, formerly the residence of Lord Charlemont, in Parnell Square. The City Architect, Mr. Horace T. O'Rourke, concentrated on erecting a modern and up-to-date gallery. This scheme involved considerable modification of the original building—a step regretted by some, but necessary if one recognizes that an art gallery is primarily a place in which to display pictures!

The scheme of building and reconstruction, planned on axial lines, entailed some heavy structural work. A large wall, longitudinally placed on the main axis, together with a small staircase, were removed, leaving clear for the first time an imposing approach to the main staircase up the main-vista from front to rear. The bay of the grand staircase is repeated and balanced by the apsed reconstruction of the opposite side, and additional columns have been built in the existing style, giving to the entrance halls a more imposing and dignified appearance. The two halls (vestibule and rear hall) as reconstructed are four times the area of the old hall.

A short corridor, with rooms on either side, leads from the entrance hall to a foyer and a Sculpture Hall, which latter is approximately 55 ft. by 24 ft. by 26 ft. in height, having apsidal ends and treated in the Roman Doric order, with coupled columns, a deep cornice and a handsome frieze decorated with rams' heads and festoons. Beyond the Sculpture Hall there are five centrally placed inter-communicating main galleries for oil paintings, and flanking these, on the east and west sides respectively, is a long rectangular room, the Water Colour Galleries, and an oval room, the Loan Collection Galleries. There is also a student's room and a photographic room.

The artificial lighting of the vestibule hall, corridors, stairs and room where pendant lighting is required is carried out with the Holophane reflector-refractor prismatic units, which are well suited to the dignified style of architecture, and give a very satisfactory illumination without harsh shadow effects.

The lighting of the Sculpture Hall, both natural and artificial, is effected by means of a laylight of diffusing glass formed as the ceiling. The fact that this has apsidal ends and deep curved frieze renders this method of lighting particularly suitable, the whole expanse of the hall being thus left clear of any hanging pendants. The photograph shows very clearly the general effect. One would, in fact, hardly credit that this photograph was taken after midnight by the light from the electric units above the laylight.

The natural lighting of the Picture Galleries is on the Hurst-Seager system—top side lighting. The light enters through the ceiling by means of a wide channel, which runs round the four walls, and whilst illuminating the picture, leaves the spectator in comparative shadow, thus minimizing his mirrored reflection in the picture glass.

The artificial lighting is imitative of this same system. Special lighting troughs, incorporated in which are a series of Holophane prismatic reflectors, are fitted along the sides of the beams formed around the inner sides of the lighting gables. These lighting troughs and reflectors are constructed to give a relatively high vertical intensity of light over the wall areas. They are so arranged that it is practically impossible to get reflections or images of the light-sources from any normal position at which an observer would stand.

The galleries vary in size and construction, so that different types and sizes of lighting troughs were necessary to give the desired effects. The main Oil Galleries Nos. 1 to 5 are similar in general construction. The ceilings are formed into panels with deep dividing beams, the troughs being fitted against the outer side of the sections so formed and directed at the requisite angle, depending upon the height and distance of throw required. To ensure adequate illumination on the corner sections of the wall, special corner-shaped troughs were constructed.

The height of the lighting trough in these galleries is 15 ft. from the floor, and the distance from the walls is 7 ft. Taking Oil Gallery No. 3 as representative, the wall space is 60 ft. long by 24 ft. wide, with two doors through the centre sides. These spaces are not treated. To treat the remaining wall surface there is 86 ft. of troughing, incorporating 88 reflector units equipped with 75-watt lamps. All these troughs are provided with daylight-blue colour-correcting glass screens, and the vertical illumination obtained with this combination is 4.7 foot-candles.

With the Long Galleries on the east and west sides, the ceiling heights are low, the troughs being only 9 ft. from the floor and the distance from the walls of 3 ft. 6 ins. Here was a much more advantageous condition. The length of these galleries is 66 ft. and the width 17 ft., and with the low ceiling and fewer breaks in regard to cross-beam construction, long lengths of uninterrupted trough could be used with corresponding improvement in lighting effect. In these two galleries there are 123 ft. of troughing, incorporating 132 reflector units with daylight-blue correcting screens.

In the Oval Galleries, on the east and west sides, the ceiling heights are greater, being 15 ft. to the lighting troughs, and the area much smaller, the length being 44 ft., including the circular ends, by 17 ft. wide. In these two galleries 90 ft. of troughing is used, incorporating 88 reflector units, with 60-watt lamps, giving a colour-corrected illumination on the vertical wall surfaces of approximating 4 foot-candles.

The Dublin Gallery of Modern Art is one of the very few which has been designed specially for the natural and artificial-lighting effects.

The City Architect, Mr. Horace T. O'Rourke, F.R.I.B.A., M.R.I.A.I., was responsible for the constructions, assisted by Mr. R. Sorley Laurie, Dip.Arch.Abdn., A.R.I.B.A., of his department. The design of the artificial lighting was carried out with the collaboration of the Illuminating Engineering Department of Messrs. Holophane Ltd.

Dublin Art Gallery—Loan Collection Gallery.

Dublin Art Gallery—Oil Gallery No. 3.

A Compound Lighting Unit

The combination of the light emitted from mercury-vapour lamps with that from incandescents is somewhat largely used in one part of the World's Fair, now open at Chicago. The satisfactory result of this experiment seems to have encouraged the construction of units comprising both light-sources in other directions.* For instance, the Pennsylvania Electric Co. have lighted their showroom 110 ft. by 40 ft. with eight combination laylights 5 ft. by 8 ft. overall, each embodying thirteen 500-watt incandescent lamps and four mercury-vapour lamps consuming, with their accessories, 575 watts, the total wattage per lighting unit being 8.5 kilowatts.

With this equipment an evenly distributed illumination of 40 candle-power of an approximately natural daylight colour is obtained. The effect is stated to be very satisfactory, and to produce the psychological impression of an agreeable coolness.

The first cost of the installation, including all the lamps and fittings, has been found not to exceed that of one with only one variety of lamp, while the running and maintenance cost, in so far as experience has gone, is moderate.

One of the sales-rooms of the Wanamaker firm has been lit with similar units, but in this case aggregated around four pylons, and thus easily introduced without structural alterations.

The first-named installation, with an energy utilization of 15½ watts per square foot of floor area, in a room with no special ventilation, radiator heated, and therefore without chimneys, presented a problem in heat dissipation. This was solved in a novel manner by almost entirely enclosing the incandescent lamps in "Macbeth" heat-absorbing glass, and exhausting the air from the fitting at the rate of 600 cubic feet per minute from each of the eight laylights. The result of this has been eminently satisfactory and economical to the extent that the fuel bill for the radiators was reduced 50 per cent., and no fans were needed even in the hottest weather. Somewhat interesting is the fact that experience proved it necessary to run the exhaust fans for about five minutes after switching off the lights, as otherwise the heat-absorbing glass built up temperature from the surroundings, and was liable to crack. Combination fittings of mercury vapour and incandescent lamps are now being put on the market in the U.S.A. at a price of from $70 upwards. J. E.

* *Elec. World*, April 15th, 1933, p. 480.

Comfort and Economy

The universal adoption of pressures of the order of 230 volts for consumers' lighting circuits has made it difficult to use small-power lamps for many purposes where they would serve. The spread of alternating current, however, has provided a remedy, as it is possible to connect the secondary circuit of a bell transformer to a low-voltage lamp, which can be of the torch-light variety, say, operating with 4 volts and about 0.2 ampere. Such a lamp is adequate for a small passage, wine or coal-cellar entrance, cupboard or dark-room. The grade of wire, switch and lampholder need not be high; the first cost of material and fixing is correspondingly low. The consumption is almost infinitesimal, being about a quarter of a unit per month for 10 hours per day burning. J. E.

"—use only"

Director: "What *is* the matter with our electric light these days? We seem to have less light and to pay more for current than ever before."

Manager: "I'm afraid we made the mistake of installing 'cheap' lamps at the beginning of the winter. They lose light very quickly and replacements have been unduly heavy. We shall not make the same mistake again, but in future will use only

MAZDA LAMPS

WITH THE WONDERFUL NON-SAG FILAMENT.

3447 A

MADE IN ENGLAND ENTIRELY FROM BRITISH MATERIALS.

THE BRITISH THOMSON-HOUSTON COMPANY, LTD.

FIG. 2.—A Conference Room at the World Economic Conference, lighted by six G.V.D. Pearl fittings, direct type, equipped with 150-watt lamps.

Some Examples of Modern Office Lighting

THROUGH the courtesy of G.V.D. Illuminators, we reproduce, in Figs. 1 and 2, views of two rooms used for the World's Economic Conference in which G.V.D. lighting units have been installed. The Press room, shown in Fig. 1, is 70 ft. long, 40 ft. broad, and 15 ft. 9 ins. high. It is illuminated by ten 14-in. Pearl fittings of the direct type, mounted 9 ft. above the working plane and spaced 15 ft. apart and equipped with 200-watt lamps.

The Conference room (Fig. 2) is 48 ft. long, 30 ft. broad, and 10 ft. 9 ins. high. In this case the lighting is effected by six 12-in. Pearl fittings of the direct type, mounted 7 ft. above the working plane and equipped with 150-watt lamps, the spacing being the same as before. These two illustrations will serve as a good example of direct lighting with the G.V.D. system. We understand that the illumination in both cases is approximately 10 foot-candles on the working plane.

The remaining two illustrations show quite different methods. Fig. 3 shows the room occupied by Dr. Dellers at the University of London, which is 30 ft. square and 20 ft. high. This exceptional height is explained by the fact that the room, housing a considerable number of books, has a gallery 12 ft. above the floor with a 4-ft. passage, and books both above and below. Good lighting is therefore required in every part of the room, which is furnished by a combination of direct and indirect lighting. In the centre of the room there is one 14-in. indirect fitting equipped with 200-watt lamps which serves to illuminate the desk and table, and also to give light to the shelves above the gallery. In addition there are four 12-in. direct-lighting units, each equipped with 150-watt lamps suspended underneath the galleries. The room illustrated in Fig. 3 strikes one as a somewhat difficult problem, partly because of the dual requirements imposed on lighting fittings, and partly because of the low reflection power of the shelves of books which always tend to cause a library to appear, in a visual sense, insufficiently lighted. In this case, we understand, the room does in fact appear quite sufficiently bright. The central indirect fitting is probably the only satisfactory method of lighting shelves traversed by a gallery where the person of the reader is apt to come between the light-source and the surface to be illuminated.

The final illustration (Fig. 4) shows the Director's room of the Sussex Electric Supply Corporation. This is illuminated in quite a different method, namely, by means of G.V.D. laylight, 7 ft. square, and equipped with lamps of a total wattage of 500. The room is 30 ft. long, 22 ft. broad, and 12 ft. high, and is quite efficiently illuminated with this very moderate consumption. It will be recalled that the chief characteristic of this laylight is the ingenious combination of a lamp in a projector with a specially curved diffusely reflecting surface, which is completely superimposed over the glass below. In these circumstances the glass surface may be quite lightly diffusing and yet appear of substantially even brightness, and the low overall height which this system makes possible is a distinct advantage.

FIG. 1.—The Press Room at the World Economic Conference, illuminated by ten G.V.D. 14-in. Pearl indirect-type fittings, equipped with 200-watt lamps.

FIG. 3. -A Room in the University of London, showing special equipment for lighting Table, Bookshelves and Gallery by means of combined direct and indirect lighting.

FIG. 4.—The Director's Room, Sussex Electric Supply Corporation, receiving illumination from G.V.D. Laylight, 7 ft. square, and equipped with lamps of a total wattage of 500.

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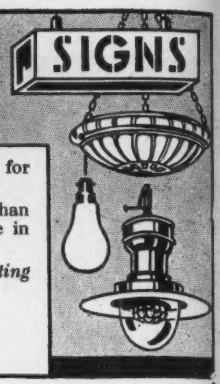
A DIRECTORY OF LIGHTING EQUIPMENT



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Any readers having these copies for disposal are requested to communicate with THE ILLUMINATING ENGINEER, 32, Victoria Street, London, S.W.1.

Sheffield Illumination Society

On June 29th a party of members and friends of the Sheffield Illumination Society paid a very interesting and instructive visit to the Neepsend Works of the Sheffield Gas Company. Mr. H. H. Collett, the Superintendent, explained the whole method of gas production, from the unloading of the coal to the production of the impure gas, the purifying and washing and the ultimate reception of the pure gas through the meters into the storage tanks. Mr. Collett also explained how the calorific value of the gas is taken and recorded, and how the supply to the consumers is automatically governed.

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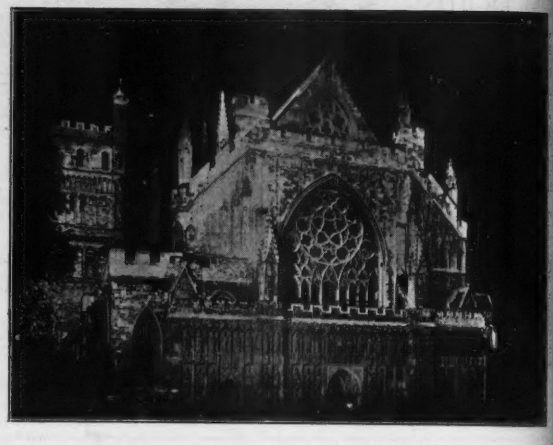
The Floodlighting of Exeter Cathedral

The accompanying illustration shows the floodlighting of Exeter Cathedral, as recently carried out for the Exeter Corporation Electricity Undertaking. This cathedral offers an excellent subject for such treatment, as there is an open space permitting a distant view of the front of this fine building. The floodlighting was effected by Holophane projectors similar to those used for the lighting of Westminster Abbey and Big Ben on the occasion of the International Illumination Congress in 1931. Ten units, mounted in trees on the Cathedral Green, are used for the west front. Three long-range type units are used to illuminate the west face of the North Tower, and are supplemented by wide-angle type projectors mounted on the cathedral roof.

Three rectangular beam type units are used for the north face of this tower. The South Tower is lighted on the south side by two rectangular beam type units, and on the west side by two rectangular type and one concentrating type projector. The whole installation thus uses twenty-three Holophane 1,000-watt projectors.



A View of Exeter Cathedral floodlighted.

Floodlighting during the Wakefield Pageant

During the Wakefield Pageant, which took place on June 17th to 24th, three very successful floodlighting installations were carried out in that city. Two of these, the famous Cathedral and the Grammar School, were of a temporary character. The third installation, the city's War Memorial Cenotaph, is to be a permanent feature.

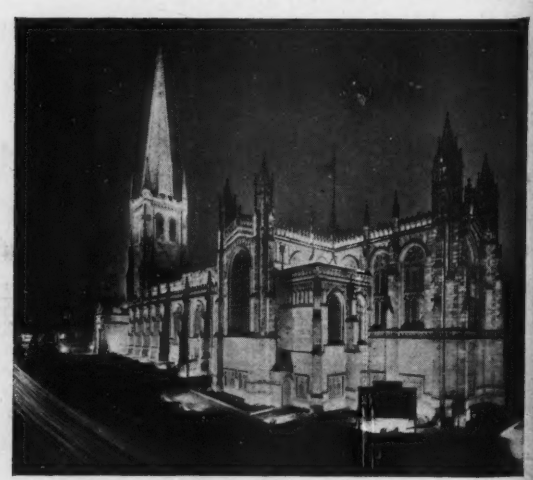
The Cenotaph War Memorial.

Wakefield Grammar School.

The layout for each installation was designed and prepared by the Illuminating Engineering Department of Messrs. Siemens Electric Lamps and Supplies Ltd., at the invitation of the City Electrical Engineer (Mr. R. O. Seville), and with the assistance of the Deputy Electrical Engineer (Mr. H. White). In all, 74 Siemens floodlights and projectors, ranging in sizes from 200 to 1,000 watts, were used. In order to illuminate the Belfry Tower spire of the Cathedral, which rises to a height of 247 ft., a beam-throw of approximately 300 ft. was necessary for certain projectors. The approximate overall length of the building is 230 ft.

The Grammar School in one sense offers a particularly difficult problem, as the actual stonework is almost black. The accompanying photograph shows, however, what can be done even in these circumstances. The permanent floodlighting of the Cenotaph War Memorial is effected by means of two specially constructed asymmetric floodlights equipped with adjustable side-shields.

These floodlighting installations attracted much local interest, and were witnessed by crowds every evening. There is no doubt that in future floodlighting displays will form a regular adjunct during Festival Weeks, Pageants, and the like.



The Cathedral at Wakefield.

Printed by Taylor Garnett Evans & Co. Ltd., Manchester and London.